

# Typical plant cell

contains chloroplasts and a permanent vacuole, and is surrounded by a cellulose cell wall.

**Cell wall** is composed of long cellulose molecules grouped in bundles called **microfibrils** which, in turn, are twisted into rope-like **macrofibrils**. There may be a secondary cell wall containing **lignin** (gives strength to xylem) or **suberin** (makes a waterproof layer in the endodermis). The function of the cell wall is a mechanical one - pressure from the cell protoplast maintains cell turgidity. The wall is freely permeable to water and most solutes so that the cell wall represents an important transport route - the **apoplast system** - throughout the plant body.

**Chloroplast** is the site of photosynthesis. It is one of a number of plastids, all of which develop from **proplastids** which are small, pale green or colourless organelles.

**Vacuole** may occupy 90% of the volume of a mature plant cell. It is filled with cell sap (a solution of salts, sugars and organic acids) and helps to maintain turgor pressure inside the cell. The vacuole also contains anthocyanins, pigments responsible for many of the red, blue and purple colours of flowers. Vacuoles also contains enzymes involved in recycling of cell components such as chloroplasts. The vacuolar membrane is called the **tonoplast**.

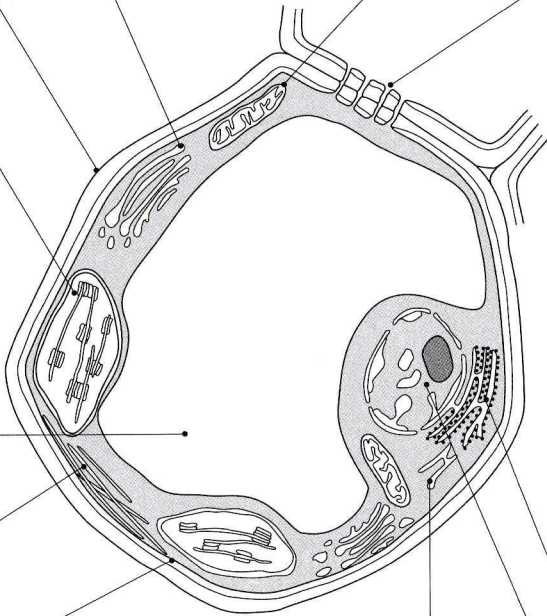
**Microtubules** are hollow structures (about 25 nm in diameter) composed of the protein tubulin. They occur just below the plasmamembrane where they may aid the addition of cellulose to the cell wall. They are also involved in the cytoplasmic streaming of organelles such as Golgi bodies and chloroplasts, and they form the spindles and cell plates of dividing cells.

**Plasmamembrane (plasmalemma, cell surface membrane)** is the differentially-permeable cell surface, responsible for the control of solute movements between the cell and its environment. It is flexible enough to move close to or away from the cell wall as the water content of the cytoplasm changes. The membrane is also responsible for the synthesis and assembly of cell wall components.

**Golgi body (dictyosome)** synthesises polysaccharides and packages them in vesicles which migrate to the plasmamembrane for eventual incorporation in the cell wall.

**Mitochondrion** contains the enzyme systems for ATP synthesis by oxidative phosphorylation. May be abundant in sieve tube companion cells, root epidermal cells and dividing meristematic cells.

**Plasmodesmata** are minute strands of cytoplasm which pass through pores in the cell wall and connect the protoplasts of adjacent cells. This represents the **symplast** pathway for the movement of water and solutes throughout the plant body. These cell-cell cytoplasm connections are important in cell survival during periods of drought. The E.R. of adjacent cells is also in contact through these strands.



Plant, animal and bacterial cells

Feature	Plant	Animal	Bacterium
Cell wall	✓ (cellulose)	✗	✓ (murein)
Nucleus	✓	✓	✗
Plasmids	✗	✗	✓
Mitochondria	✓	✓	✗
Ribosomes	✓	✓	✓ (but small)
Chloroplasts	✓	✗	✗
Permanent vacuole	✓	✗	✗

**Rough endoplasmic reticulum** is the site of protein synthesis (on the attached ribosomes), storage and preparation for secretion. The endoplasmic reticulum (E.R.) also plays a part in the compartmentalisation of the cell.

**Smooth endoplasmic reticulum** is the site of lipid synthesis and secretion.

**Nucleus** is surrounded by the nuclear envelope and contains the genetic material, DNA, associated with histone protein to form chromatin. The nucleus thus controls the activity of the cell through its regulation of protein synthesis. The nucleolus is the site of synthesis of transfer RNA, ribosomal RNA, and ribosomal subunits.